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ABSTRACT

The report examines research on differences in the interpretations of discrepant and nondiscrepant messages by normal and emotionally disturbed children and reports on a study in which tone of voice and verbal content were discrepant in their affective meaning. A review of the research on discrepant messages, their delivery, interpretation, and implications for the study of psychopathology is presented first. Then the methodologies used in these studies are described in relation to the comparability of findings. Also discussed are adult-child and normal-disturbed differences in the interpretation of affective meaning in consistent and discrepant messages. Two preliminary experiments validated the affective content of 29 sentences and of tone of voice respectively. Among results of the study comparing disturbed (N=34) and normal (N=34) 7- to 10-year-old children's interpretations of messages were: both groups rated discrepant messages as more angry than nondiscrepant messages; disturbed children were more likely to interpret messages primarily on the basis of verbal content; and disturbed children interpreted messages as happier than did normal children. (DB)

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DIFFERENCES IN THE INTERPRETATION OF DISCREPANT AND NONDISCREPANT MESSAGES BY NORMAL AND DISTURBED CHILDREN

by
Margaret Friend
and
Judith E. Becker

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RESEARCH BULLETIN

DIFFERENCES IN THE INTERPRETATIONS OF DISCREPANT AND NONDISCREPANT MESSAGES BY NORMAL AND DISTURBED CHILDREN

by

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and

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F.E.R.D.C. NOTES ON THIS EDITION

What happens when the words say yes, but the tone of voice, body language, or other forms of communication indicate otherwise? Discrepant messages are quite commonly received by most of us, and despite being puzzled from time to time, we have learned to accept such messages, process them, and take such action as our experience has taught was safe. Margaret Friend and Judith Becher have conducted research on this area using both normal and disturbed children in the 7 to 9 age group. Their findings are most important to teachers and parents of young children, especially those who work and live with disturbed children. F.E.R.D.C. is pleased to publish these findings because we believe that this is most important information for those who teach and those who are parents.

Charlie T. Council
Executive Secretary

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DIFFERENCES IN THE INTERPRETATION OF DISCREPANT AND NONDISCREPANT MESSAGES BY NORMAL AND DISTURBED CHILDREN

As members of a society, we are necessarily involved in many kinds of dialogue on a daily basis. Our ability to function effectively within society depends on our ability to make sense of these daily communicative interactions. Using a single sentence, a speaker can convey many kinds of information. These include facts, desires, intentions, and emotions. The ability of the listener to make such fine discriminations is especially important very early in parent-child relationships.

Even before children have the words to express emotion, they must become sensitive to the variety of emotions expressed by their parents. This is essential to their ability to obtain reinforcement for their behaviors. A child must discern the emotional state of his/her mother before asking for a cookie, for example. If the mother is very angry, the child is likely to experience some rejection and not receive the cookie. The child may even be punished. If, on the other hand, the child has learned that certain behaviors exhibited by the mother indicate that she is "mad" and that approaching her may not be very reinforcing, the child may be able to avoid punishment by waiting until later to ask for the cookie. As the child grows older, this discrimination of emotion becomes important in many relationships beginning with parents and extending into school, friendships, and work. The accurate detection and interpretation of emotion allows us to make better decisions about the ways in which we interact with our environments. We are able, through discrimination, to engage our environments selectively in ways that increase the probability of reinforcement. Children who are unable to discriminate others' emotions may have trouble at home with parents and siblings, or with teachers and peers in school. It is easy to see how the ability to make fine discriminations can be essential to our success in nearly every encounter.

Emotion (often referred to as "affect" in the literature) may be conveyed through many different channels: verbal content, body

language (e.g., posture, gestures, proximity), facial expression, and tone of voice. Researchers have used the terms "tone of voice," "intonation," "tone," and "vocal content" to describe the nonverbal component of messages which is expressed primarily through changes in pitch, amplitude, stress, and rate of delivery. These characteristics which comprise tone of voice may be modulated through changes in the musculature of the larynx (the cavity surrounding the vocal cords), the musculature of the jaw, and the size and shape of the opening of the mouth. For instance, it is not uncommon to see a person speak in anger with jaw tight, the corner of the mouth upturned and a small opening between the lips. These visible changes (which are also expressions of affect) act in concert with pitch, amplitude, stress, and rate of delivery to produce a sound (a tone of voice) that carries specific information about the affective state of the speaker. These acoustic properties represent one of the ways in which tone of voice may be described.

In the psychological literature, tone of voice is more often described according to its psychological properties. Such description involves the operational definition of tone of voice as the particular affective classification imposed by a listener. That is, when a person hears a message and identifies its nonverbal, nonvisual component as anger, sadness, or happiness, the tone of voice of that message is then operationally defined as representing the given classification. Thus, the psychological properties of tone of voice entail the way in which tone of voice is perceived and interpreted by the listener.

Given the number of acoustical characteristics which contribute to a particular tone of voice and the number of affective dimensions a person might potentially express, it is clear that tone of voice is a complex phenomenon. It is a difficult task to identify the way in which these characteristics combine to produce a tone of voice that can be reliably interpreted as expressive of happiness, sadness, anger, or any other affective state. Additionally, since tone of voice is inextricably tied to verbal content in natural occurrences, it is difficult to measure the impact of tone of voice alone on the interpretation of a given message. Filters and white noise generators have been employed for this task, but neither can remove verbal content entirely because this results in the simultaneous removal of any recognizable tone of voice.

Other methods include the reading of nonsense syllables or letters of the alphabet using different tones of voice. In these methods, tone of voice can be measured but its impact, relative to verbal content, on the interpretation of messages cannot.

Measuring the relative contributions of different channels to the interpretation of a message is crucial in the study of discrepant messages. A message is discrepant when the meaning conveyed by any one channel conflicts with the meaning conveyed by another channel. When a positive visual channel is combined with a positive tone of voice and negative verbal content, the resulting message is interpreted as humor or joking by adults as is a combined positive visual channel, negative tone of voice, and negative verbal content (Bugental, Kaswan, & Love, 1970). That is, while both positive and negative messages are being given simultaneously in these combinations, it appears that the positive components may be given greater weight during interpretation. The combination of a positive visual channel, negative tone of voice, and positive verbal content as well as a combined negative visual channel, negative tone of voice, and positive verbal content is interpreted as sarcasm. In these cases, it appears that somewhat greater weight may be given to the negative message components. A possible explanation for the selection of some message components over others is that particular channels are more salient for the resolution of discrepant messages. In the examples above, the meaning conveyed by nonverbal channels (tone of voice and visual) is consistent with the interpretation of the entire message, but this is not true for verbal content.

In this paper, I present a review of the research on discrepant messages, their delivery, interpretation, and implications for the study of psychopathology. I present methodologies employed in these studies and consider the comparability of findings using these methods. I also discuss adult-child and normal-disturbed differences as they relate to the interpretation of affective meaning in consistent and discrepant messages. Finally, I present a study that examines the differences in the interpretation of messages in which tone of voice and verbal content are discrepant in their affective meaning.

Discrepant Messages

Bugental, Love, Kaswan, and April (1971) videotaped families while they engaged in a set of planned interactions. The disturbed sample was comprised of families in which a child had been referred to a Psychology department clinic. Families were first videotaped during a five-minute wait in which no instruction were given. Then, brief, arranged dyadic interactions were recorded. Finally families were instructed to discuss ways in which they could improve as a family and these interactions were recorded. The researchers observed that, compared with controls, mothers in the disturbed sample produced more discrepant messages. This difference was not found for fathers in the study. Message discrepancy involved a conflict between verbal content and tone of voice or between verbal content and facial expression.

In a similar study, Blotcky, Tittler, and Friedman (1982) videotaped the interactions of families who had one child placed in a short-term residential treatment program for emotionally disturbed children. The families had been instructed to discuss ideas and decide on five common goals during the taping session. Messages were operationally defined as conflicting (discrepant) whenever a positive message in one channel and a negative message in another channel occurred simultaneously. Positive and negative messages were established by judges' ratings. Mothers were found to deliver discrepant messages significantly more often to the disturbed child than to their husbands or to nonsymptomatic siblings. The disturbed status of the child alone, independent of sex and age, appeared predictive of this discrepant communication. Both the Bugental et al. and Blotcky et al. studies have important implications for the double-bind theory of schizophrenia (Bateson, Jackson, Haley, & Weakland, 1956) and they suggest that this potentially pathological form of communication may be relevant to nonpsychotic disturbances as well.

Researchers who have examined the resolution of discrepant messages have varied the meaning conveyed by different channels along a positive-negative continuum. In many cases, subjects have been instructed to convey particular affective meanings along different channels (e.g., a positive verbal statement delivered in a

negative tone of voice). An early study by Davitz and Davitz (1959) revealed that speakers performed well when instructed to convey particular emotions while reciting the alphabet. Each of ten emotions was identified at a greater than chance frequency and judges' overall accuracy was also significant. This study is the basis for much of the subsequent research in this area.

Resolution of Discrepant Messages by Adults

Some researchers have focused on the channels to which adults attend when resolving a message whose meaning is discrepant between channels. Single words which represented positive, neutral, and negative attitudes and tones of voice which represented these same dimensions were combined in a study by Mehrabian and Weiner (1967). The stimulus words were chosen by means of objective ratings while tones of voice were obtained by instructing two speakers to convey either an attitude of liking, high evaluation, or preference; a neutral attitude; or an attitude of disliking, low evaluation, or lack of preference. Aside from the instructions to produce a particular tone of voice, it appears that there were no objective ratings of this channel. Subjects were instructed to attend to verbal content only, tone of voice only, or to use all of the information present in order to interpret the attitude of the speaker. That is, in each condition both content and tone of voice channels were present, but subjects were instructed to attend selectively to one or both channels. Results under each condition varied as a function of the speaker. For speaker A, the effects of tone of voice were significant for both the "use tone only" and the "use all information" conditions. For this speaker, the effects of verbal content were significant only in the "use content only" condition. For speaker B, the effects of tone of voice were weaker though still significant for the "use tone only" and the "use all information" conditions. For the latter condition, a significant tone of voice by verbal content interaction was also present. Under the "use content only" condition, the effect of content was again significant.

Clearly the methodology employed by these researchers limits the generalizability of their findings. First, it is difficult to determine the extent to which the interpretation of single word utterances can be generalized to the interpretation of full sentences. The paucity of information present may influence the relative dependence of the

subject on verbal content versus tone of voice. Second, it is questionable that subjects can selectively attend to only one channel when multiple channels are presented. Finally and most importantly, since tone of voice was not objectively rated during the stimulus development stage, one cannot be certain of the extent to which tone of voice was actually discrepant from verbal content.

Solomon and Yaeger (1969) also studied the relative importance of verbal content and tone of voice on adults' interpretations of discrepant messages. Subjects heard recordings of short sentences in which verbal content was varied along positive, neutral, and negative dimensions. Tone of voice was varied to convey pleasure, indifference, and displeasure. Verbal content had been previously rated and tone of voice was assessed by the authors as the stimuli were recorded. Subjects were told that they were listening to an art teacher giving feedback to a student. After each stimulus sentence was played, the subjects were asked three questions: 1) "What did the teacher mean?" 2) "How does the child feel?" and 3) "Does the teacher like or dislike the child?" Subjects' use of verbal content as opposed to tone of voice in the interpretation of messages varied among conditions. While significant tone of voice by verbal content interactions were found for each question, the effect of content was greatest for question 1 and least for question 3. The effects of tone of voice showed the opposite pattern. Question 1 requires a judgment by the subject about the teacher's opinion of the child's work. Question 3 requires a judgment about whether the teacher likes the child. A positive or negative judgment in either of these questions does not presuppose the same judgment about the other. Judging that the teacher likes the child, for example, does not necessarily imply that the teacher will have a positive opinion about the child's drawing. Thus, it appears that tone of voice and verbal content channels may be differentially weighted according to task demands.

When adult subjects viewed videotaped episodes in which verbal content and nonverbal (visual and tone of voice) channels were varied to convey attitudes of superiority, equality, and inferiority, verbal content which was consistent with nonverbal channels only served to influence the strength of the ratings (Argyle, Salter, Nicholson, Williams, & Burgess, 1970). When a nonverbal message of superiority

was combined with a verbal content of superiority, for example, the entire message was rated as meaning that the performer felt more superior than if the same nonverbal message was combined with a verbal content of inferiority or equality. Verbal content appeared ineffective in the resolution of discrepancy between channels.

Independent ratings of typescripts of verbal content were obtained. The nonverbal component of the messages was also rated independently, but the authors failed to describe the way in which this was accomplished. The researchers reported that ratings were made of videotapes of a performer reading numbers. Presumably the performer maintained the same postures, facial expressions, and gestures as in the stimulus videotapes, but it is unclear how a consistent tone of voice was maintained for rating purposes.

Main effects were found for the nonverbal channel in four of the ten rating scales employed in this study. These scales were: unpleasant-pleasant, she liked me-she disliked me, degree of emotional impact, and pleasant-unpleasant emotional impact. For the rest of the scales in the study, a verbal content by nonverbal content interaction was found. These scales were: hostile-friendly, stable-unstable, confusing-straightforward, inferior-superior, sincere-insincere, and submissive-dominant. The group of scales for which significant main effects of the nonverbal channel were found were similar in that they required the raters' subjective decision about the way in which they were affected by the message. In contrast, the scales for which an interaction was present required the raters to make a more objective decision about the speaker. As in the Solomon and Yaeger study (1969), task demands probably affected the salience of verbal versus nonverbal channels in the interpretation of discrepant messages.

Using the audio portion of videotapes obtained in her 1971 study of normal and disturbed family interactions, Bugental (1974) found evidence for two processes for the resolution of discrepant messages. The difference in the method of resolution appeared to be a function of the "credibility" of the speaker's tone of voice. Credibility was defined as the degree of consistency between the speaker's tone of voice and facial expression and was determined prior to presentation of the audio portion of the tapes to adult subjects. The utterances of

the parents of disturbed children were typified by a neutral facial expression accompanied by either a positive or negative tone of voice and extremely positive or negative verbal content.

Messages in which tone of voice was rated as highly credible showed significant effects of tone of voice in their interpretations regardless of the intensity of verbal content. When the tone of voice was low in credibility, greater weight was given to the positive message component if the verbal content was moderate and to the negative message component if the verbal content was extreme. Moderately credible messages (those most typical of disturbed families) were resolved in the same way as low credibility messages with extreme verbal content. That is, there was a tendency to rely on the negative message component and to discount any positive implications in the interpretation of this type of message.

This study clearly opens new avenues for research on the resolution of discrepant messages. It is difficult to determine, however, the extent to which these findings are directly comparable to those of other studies. As indicated previously, the method of resolution chosen by a subject appears to be dependent upon task demands. It is unclear how the rating scales employed in this study (friendly, approving, considerate vs. unfriendly, disapproving, inconsiderate) compare with the attitude ratings performed by subjects in the Mehrabian and Weiner (1967), Solomon and Yaeger (1969), and Argyle et al. (1970) studies. Also, due to the fact that some of the stimulus voices were not clearly audible, subjects in the Bugental study were provided with typescripts of verbal content which were placed beside the rating scales. The effect of the greater availability of one channel over another is an important consideration when making inferences about methods of resolving discrepant messages. It is unclear how this difference in availability may have affected subjects' use of verbal content versus tone of voice channels in the interpretation of messages.

Deception is a variation of the discrepant message insofar as the individual is unable to control a deceptive message across channels, thereby creating between-channel conflict. In this case, discrepancy would be most pronounced between the channels over which the

individual has the most and least control. In a study of deceptive messages (Zuckerman, Amidon, Bishop & Pomerantz, 1982), message senders were instructed to produce truthful, concealing, and deceptive messages. Each message was subsequently rated along these dimensions for each of five combinations of channels (face, tone of voice, verbal content plus tone of voice, face plus tone of voice). When subjects rated tone of voice as deceptive, this was positively correlated with an instruction to the sender to produce a deceptive message. When senders had been instructed to produce a truthful message, subjects more accurately rated facial expressions as truthful. This suggests that tone of voice provides greater information about deception while facial expression more accurately reflects the truthfulness of a message. It can be seen as adaptive, then, to attend more closely to the channel which provides the greatest and most accurate information about a message. While all discrepant messages are not necessarily deceptive, perceived deceptiveness may influence the channels to which a person attends when attempting to decipher such messages.

Child-Adult Differences

Children do not always resolve discrepant messages in the same way as adults. In a study by Bugental, Kaswan, and Love (1970), children and adults rated videotaped messages in which verbal content, tone of voice, and the visual channel were systematically varied to convey friendliness, approval, and consideration or unfriendliness, disapproval, and lack of consideration. The videotapes were made of actors (psychology graduate students and faculty) who had been given scripts (verbal content) to read aloud. The scripts had been rated previously as conveying the dimensions mentioned above and the actors were instructed to produce either a positive or negative tone of voice and a positive or negative visual impression. Tone of voice and the visual channel were rated independently on the same dimensions as were used for the verbal content. Ratings of the visual channel were obtained by showing the videotapes without their audio components and the audio portion of the tapes was played through a filtering device to obtain ratings of tone of voice. As mentioned earlier, filtering techniques tend to leave some verbal content intact thereby confounding ratings of tone of voice.

When 80 children aged 5 to 12 years and their parents (one parent per child; sample balanced for sex) viewed the videotapes, messages were presented in all channels (verbal content, tone of voice, and visual) simultaneously. Only one significant difference was found between the ways children and their parents interpreted the messages. Positive picture, positive tone of voice, and negative verbal content combinations were rated as slightly friendly by adults and as neutral by children. For children and adults, an interaction between verbal content and tone of voice was found. Dominance of tone of voice was found only when it had been previously rated as negative. No interaction was found between tone of voice and the visual channel.

The difference in children's and adults' ratings of positive picture, positive tone of voice and negative verbal content might be explained in a number of ways. Bugental et al. contended that negative input in either auditory channel will result in a negative interpretation of the message. Another possibility is that message discrepancy accounts in part for a more negative interpretation of the message. The extent to which these messages were discrepant cannot be clearly determined, however. The terms negative and positive seem to have been used almost interchangeably with the dimensions they were designed to represent (i.e. friendliness, approval or consideration vs. unfriendliness, disapproval, or lack of consideration). When an actor is instructed to produce a positive or negative tone of voice or visual impression, it is not clear that ratings of the dimensions above are actually measures of the same construct. That is, the magnitude of the influence of any channel cannot be estimated due to the fact that the dimensions represented by the verbal content of the messages cannot be equated with the dimensions represented by tone of voice or the visual channel.

A third possible explanation for the child-adult difference observed by Bugental et al. is the strong reliance on verbal content found for children in a study by Solomon and Ali (1972). Subjects included children in kindergarten and grades 2, 4, 6, 8, 10, and 12, and college sophomores. Four sentences representing three levels of verbal content (positive, neutral, and negative) were systematically combined with pleased, indifferent, and displeased tones of voice. Verbal content was rated by 15 adults and tone of voice was assessed

by the researchers during taping. Attempts were also made to keep volume constant across tones of voice. The stimuli were recorded by an actress.

The subjects were told that they were about to hear an art teacher speaking to a student. As each tape-recorded message was presented, the subject was asked three questions: 1) What did the teacher mean? 2) How does the child feel? and 3) Does the teacher like or dislike the child? There were five possible responses for each question. Questions and responses were read to the kindergarten subjects while subjects in the second grade and above were shown cards on which each the question and the possible responses were written. The relative importance of tone of voice, as indicated by the children's responses, appeared to be a function both of the question and of the child's age. Younger children relied almost entirely on verbal content in their responses to all of the questions. For question #3, however, the effect of verbal content peaked at grades 4 and 6 and showed a slow decline thereafter. At the college level, the effect of tone of voice was greater than that of verbal content for question #3. Again, as in the Solomon and Yaeger (1969) study, task demands appeared to have influenced the relative dependence of subjects on verbal content as opposed to tone of voice.

Children appear to differ from adults primarily in their dependence on verbal content for the interpretation of discrepant messages. This dependence shows a gradual decline beginning sometime between grades 4 and 6 for tasks which require a more affective interpretation of discrepant messages. Differences in the interpretation of affectively discrepant messages have also been shown to exist between normal and disturbed populations.

Normal-Disturbed Differences

Before presenting the research on differences observed in message interpretation as a function of "disturbance," it is necessary to operationally define this global term. The word "disturbed" has been used to refer to both behavior disorders and psychotic disorders. Hence, to say that a population is disturbed is not necessarily to say that it is in any way homogeneous. In the literature, children who have been identified by parents, teachers, or peers as having behavior

problems; children who are revealed by parent, teacher, or peer ratings to be socially rejected or socially neglected; children who have been referred to a special classroom or clinic; and children from disrupted families have been classified as disturbed. Although these criteria do not establish a clear disturbance of emotion or thought, they do identify children for whom social adjustment is clearly more difficult than for other nonpsychotic children who do not meet these criteria. Given this, it is also quite reasonable to expect that the accurate interpretation of messages is especially crucial for this group.

In a study by McCluskey, Niemi, and Albas (1978), six 12-year-old boys, half of whom were labeled as disturbed, acted as message senders to a group of 20 disturbed and 20 nondisturbed 12-year-old boys. The message senders were asked to convey each of your emotions (happiness, sadness, love, and anger) using any verbal content they desired. Upon presentation to the boys who acted as receivers, the speech samples were filtered to remove verbal content. Receivers were given a checklist on which the words happiness, sadness, love, and anger appeared and were instructed to choose one of these to describe each message.

A strong speaker by receiver interaction was found. This effect appears to be due to the increased accuracy of each group when receiving messages from a sender of the same classification (disturbed-normal). It should be noted, however, that the disturbed sample was still less accurate overall than the nondisturbed sample. Another finding was that, regardless of the speaker, both normal and disturbed samples were more accurate in their identification of negative versus positive emotions.

In a subsequent study, McCluskey and Albas (1981) examined normal and disturbed boys' perceptions of discrepant messages. The subject pool consisted of 60 children: 20 second graders, 20 fourth graders, and 20 sixth graders. At each grade level, half of the children were classified as normal and half as disturbed. Three female speakers were instructed to read positive (happy, loving) and negative (sad, angry) sentences in consistent and in conflicting tones of voice. That is, each speaker delivered happy messages in both happy and sad tones of

voice, loving messages in both loving and angry tones of voice, sad messages in both sad and happy tones of voice, and angry messages in both angry and loving tones of voice. Adult raters used typescripts to rate verbal content and a filtering technique was employed to obtain ratings of tone of voice.

The children's task was to point to a face on a 5-point scale indicating how happy or sad the message made them feel. There were significant effects of type of message, age, and type of listener. The negative response of children across age groups and across samples (normal and disturbed) to discrepant messages is reflected in the effect of type of message. Significant interactions were found for type of message (consistent or discrepant) by age, type of message by type of listener (normal and disturbed), verbal content by age, and type of message by verbal content by age. Younger children responded significantly more negatively than older children to discrepant messages and disturbed children responded more negatively than did the normal sample. Also of interest is the significant verbal content by age interaction which supports the findings of Solomon and Ali (1972).

In summary, discrepant communication is a phenomenon with which individuals are faced daily in their social exchanges and is particularly characteristic of mother-child interactions in which the child has been labeled disturbed. Discrepant communication can take many forms, but of particular concern here are affectively discrepant messages in which the discrepancy occurs between tone of voice and verbal content.

It can be inferred from the research presented here that differences exist in the ways that discrepant messages are interpreted. Factors which appear to exert the greatest influence on the interpretation of discrepant messages are age, disturbance, and task demands. Adults rely most heavily on tone of voice when interpreting the affective content of a discrepant message. This pattern is subject to change depending upon the demands of the task at hand. Children appear to rely on verbal content more heavily than on tone of voice, though dependency on this channel peaks and begins to decline between ages 9 and 11 years. At this point, there appears to be a steady increase in

the use of the tone of voice channel when making affective interpretations of discrepant messages.

Disturbed children are less accurate overall when compared to normals in identifying affect even when the message is consistent between channels. Younger children and disturbed children respond more negatively to discrepant as opposed to consistent communications. Whether normal and disturbed children differ in the way they interpret discrepant messages has not yet been determined.

There are many methodological concerns in the study of discrepant communication. The difficulty lies not so much in the actual stimulus presentation and data collection, but rather in the development and validation of appropriate stimulus materials. It is essential that tone of voice be measured independently of verbal content in order to define the stimulus clearly. Thus far, filtering techniques are the most popular method of accomplishing this task. The accuracy of the measure obtained using filtering techniques remains in question, however, due to the fact that some verbal content continues to be audible in filtered speech.

Not only must independent ratings be obtained for both verbal content and tone of voice, but these channels must demonstrate the same affective strength. That is, when tone of voice is used to convey a particular affect (anger, for example), it must do so to the same degree that verbal content conveys a particular affect conveyed and in terms of the strength to which this affect is conveyed. Finally, stimulus raters must be independent of the experimenter and representative of the population under study.

On the basis of the research reviewed here, a study was designed and conducted to examine the differences between normal and disturbed children in their interpretation of affectively discrepant messages. The study consisted of a series of three experiments, two of which involved the development and validation of the stimulus materials. In Experiment 1, verbal content was generated and validated. In Experiment 2, tone of voice was generated and validated. Finally, in Experiment 3, the validated stimuli were presented to two groups of children. One of the groups was a disturbed sample obtained from the

Hillsborough County School System's Severely Emotionally Disturbed Program. The second group was a normal sample obtained from the county school system.

Once the stimuli were developed and validated in Experiments 1 and 2, they were presented to the normal and disturbed samples in Experiment 3. It was predicted that:

1.) Children's ratings of the messages would be a function of both the type of message and the disturbed status of the child.

2.) Normal children's ratings of all messages would most accurately reflect the affective loading of the verbal content channel, and

3.) Disturbed children would rate messages as more angry overall than would normal children.

Experiment 1

In Experiment 1, sentences (verbal content) were chosen and evaluated in terms of affective content for use in Experiments 2 and 3. The sentences were rated by adults to reduce the stimuli into reliably rated sets. Those stimuli which were reliably rated by adults were rated by children so that only those sentences which children could rate reliably with respect to affective content would be selected for the final stimulus set.

Method

Subjects

Adult raters. Three male and three female college sophomores who were Psychology students volunteered to serve as raters.

Child raters. Twelve children were selected from the county school system to serve as raters. Demographic information was obtained about the disturbed sample for Experiment 3 before beginning this study. The child raters were matched with this sample on the basis of ethnicity, sex, and SES. SES was operationally defined as eligibility for school lunch programs. Thus, children were considered to be of low

SES if they were eligible for the school lunch program and of higher SES if they were not eligible. The demographic characteristics of the child raters were as follows: low SES black males = 25%, low SES black females = 8%, higher SES black females = 8%, low SES white males = 25%, low SES white females = 8%, higher SES white males = 16%, and higher SES white females = 8%. The children were screened for their reading ability on the basis of information provided by their teachers. The mean estimated IQ of the child raters in Experiment 1 was 87.5 with a standard deviation of 11.2.

Materials

Fifty-four stimulus sentences (verbal content) were selected from a pool of sentences obtained by D. A. Bugental (personal communication, October 17, 1984) and J. Becker (personal communication, February 28, 1985). Some of the sentences were transcribed from tapes of mothers talking to their children in a controlled setting; other transcriptions were obtained from recordings mothers made of themselves and their children in their own homes. Twenty-seven sentences were selected to represent each of two types of affective states; happy and angry. The sentences were selected on the basis of their salience to the experimenter for each of the two desired affective states (happy and angry). Once chosen, sentences were modified slightly to enhance their affective salience. Thus, the stimuli were realistic in that they were obtained from actual mother-child interactions.

Estimated IQs were obtained for each of the child raters using a short form WISC-R. The short form WISC-R consists of vocabulary and block design subscales and yields an estimated IQ which correlates at .91 with IQs obtained using the full scale WISC-R (Sattler, 1982). The vocabulary and block design subscales were administered to each rater following completion of the rating task.

Procedure

Adult ratings. Typescripts of the sentences were rated for their affective content by adult raters using a 5-point Likert scale. The points on the scale were labeled "really happy," "sort of happy," "just okay," "sort of mad," and "really mad". Sentences were listed in a randomized order with the restriction that no more than three

sentences representing the same affect were listed consecutively.

Child Ratings. Typescripts of 24 stimulus sentences, determined by the adult ratings to be representative of the desired affective states were presented individually to the child raters. The rating task took place in a room at the children's school. Instructions for the rating task were presented visually and read aloud to each child. The typescripts were presented in random order with the restriction that no more than three sentences representing the same affect were listed consecutively. The order was counterbalanced for half of the raters. The children used a 5-point Likert scale which had faces drawn above each point labeled really happy, sort of happy, just okay, sort of mad, and really mad. This scale is similar to one designed by Buck (1975) and was pilot-tested prior to its use in this study. Following completion of the rating task, a short form WISC-R (vocabulary and block design) was administered to each child. The WISC-R assessment was presented as part of the experimental procedure and was not discussed as a separate measure.

Results and Discussion

Inter-rater agreement was calculated for each sentence using the formula: agreement = # of agreements/# of agreements plus # of disagreements. Criterion agreement was set at .80 in the direction of the intended affective state (happy or angry). An effect of central tendency was found with respect to the use of the extreme ends of the scale. For this reason, the scale was collapsed to measure agreement. That is, a score of 1 or 2 was considered a happy rating and a score of 4 or 5 was considered an angry rating.

Adult agreement met or exceeded criterion for 30 of the 54 stimulus sentences. Of these, 12 were rated in the intended direction as happy and 18 were rated in the intended direction as angry. Six of the angry sentences were randomly chosen to be dropped from the study in order to present an equal number of sentences representing each affect to the children. The child raters met criterion agreement for 19 of the 24 stimulus sentences. Of these, 12 were rated in the intended direction as happy and 7 were rated in the intended direction as angry.

It is difficult to interpret the adult ratings since they constituted the first attempt at validation of these stimuli. However, the pattern of errors exhibited by the children does correspond to theories of affective development which predict that children make most of their errors in the direction of happiness when evaluating emotional content (Borke, 1971). Of the happy sentences presented to the children, all met criterion agreement. The only errors made by the children were in the direction of happiness (ratings of 1 or 2) on stimulus sentences which were intended to be angry and had received ratings of 4 and 5 by the adult raters.

In addition, the mean rating by adults for angry sentences was 4.736 while the mean rating by children for the same stimulus set was only 4.409. The mean rating by adults for happy sentences which reached agreement was 1.87 and the mean rating by children for that set was only 1.52. Children appeared to avoid scale extremes only for sentences rated as angry. This difference is probably a further reflection of children's tendency to rate in the direction of happiness. Nineteen sentences (12 happy and 7 angry) met the criterion level of agreement for the child raters. All of these were selected for inclusion in Experiment 2.

Experiment 2

Experiment 2 involved the generation and validation of stimulus tapes to be used in Experiment 3. Tones of voice representing happy and angry affective states were crossed with the stimulus sentences for happy and angry affective states that had been validated in Experiment 1. The result was a total of four conditions: happy verbal content-happy tone of voice, happy verbal content-angry tone of voice, angry verbal content-angry tone of voice, and angry verbal content-happy tone of voice.

The validation procedure involved the use of acoustical and psychological measures of tone of voice which allowed both objective and subjective description of the stimuli. Although some of the validation techniques have been employed in studies of speech stress and intonation (Crystal, 1969), this represents a novel approach to the measurement of affect in tone of voice.

Method

Subjects

Adult raters. Three male and three female college sophomores who were Psychology students volunteered to serve as raters.

Child raters. Twelve children, ages 7 to 9 years, were selected from the County School System to serve as raters. The children were screened for hearing impairment on the basis of information provided by their principal.

As in Experiment 1, the child raters were matched with other samples in this study on the basis of ethnicity, sex, and SES. The demographic characteristics of this sample were identical to those of the children in Experiment 1. Short form WISC-Rs administered to each of the child raters in Experiment 2 yielded a mean estimated IQ of 88.58 with a standard deviation of 13.

Materials

The experimenter, a female and a native speaker of American English with no obvious accent or speech impairment, acted as a message sender. Previous researchers have indicated that the discrepant communication observed in families occurs between the mother and child significantly more often than between father and child (Blotcky et al. 1982; Bugental et al. 1971). Messages were recorded onto Maxell reel-to-reel tape using a TEAC Model 3340s laboratory tape-recorder. Acoustical description of the speech samples was obtained using a Visi-Pitch Model 6087 pitch extracting device.

To control for possible contamination among conditions, the message sender generated and recorded the messages in two sending sessions which took place on two separate days. The first stimulus sentence for the initial sending session (happy) was randomly selected from a group of sentences which had been previously rated to be representative of a happy affective state. The sender read the sentence aloud in a happy tone of voice, imagining that she was speaking to a child accompanying her in a toy store. When the sender believed she could read this sentence convincingly, a reiterant speech task was introduced. This task consisted of the use of a single syllable

repeated several times to replicate the tone of voice used in the stimulus sentence. This was done in an attempt to produce an identifiable tone of voice which could be rated independently of verbal content. The reiterant speech counterpart of the sentence, "I'm really happy!" for example, would be read like this: "Ma **Ma**Ma **Ma**Ma!"

When the sender produced a reiterant speech sample whose fundamental frequency graph on the Visi-Pitch appeared to be similar to the graph for the stimulus sentence, measurements were taken of the relative fundamental frequency ranges for each. Scherer, Ladd, and Silverman (1984) reported that fundamental frequency level and range, unlike contours, contribute to the affective content of messages independently of verbal content. In the present study, range was measured by subtracting the lowest fundamental frequency for a given utterance from the highest fundamental frequency for that utterance. The distribution of difference scores between reiterant and nonreiterant speech counterparts obtained through pilot testing of the reiterant speech technique yielded a mean difference of 6.5 Hz and a standard deviation of 15 Hz. Thus, plus or minus 15 Hz became the criterion difference score between reiterant and nonreiterant speech counterparts of the same sentence. A difference of less than 15 Hz was acceptable, but a difference greater than 15 Hz was not. A reiterant speech sample which differed more than 15 Hz from its nonreiterant speech counterpart was not used in the study and the message sender continued to produce reiterant and nonreiterant speech pairs of the same sentence until the criterion was met.

The message sender then proceeded through a set of happy and angry sentences, reading each sentence aloud in a happy tone of voice and producing a reiterant speech counterpart for each. The order of the sentences was randomized within the alternating pattern. All stimulus sentences and reiterant speech samples which met criterion were recorded.

In the second sending session (angry), the sender read a sentence randomly selected from the sentences previously rated as representing anger. Again, the speaker imagined she was in a toy store accompanying the child to whom she was speaking. After producing a reiterant counterpart which met criterion for that

sentence, she proceeded through an alternating set of happy and angry sentences (randomized within the alternating pattern), reading them in an angry tone of voice and producing a reiterant counterpart for each. Fundamental frequency measurements were taken as described previously and the criterion difference between reiterant and nonreiterant speech counterparts was 15 Hz. All stimuli which met criterion were recorded.

Thirty-eight reiterant and 38 nonreiterant speech samples were recorded. Of these, there were 12 happy sentences (each read in both happy and angry tones of voice) with 24 corresponding reiterant speech recordings, and 7 angry sentences (each read in both happy and angry tones of voice) with 14 corresponding reiterant speech recordings. Thus, the four resulting conditions were: happy tone of voice-happy verbal content, happy tone of voice-angry verbal content, angry tone of voice-angry verbal content, and angry tone of voice-happy verbal content. Reiterant speech samples were recorded onto a cassette tape using a Technics Model RS-B14 cassette deck. The order of the speech samples was randomized with the restriction that there were no more than three samples of the same affect in consecutive order.

Procedure

Adult ratings. To obtain a psychological measure of tone of voice, independent ratings were made of the reiterant speech samples. By using these speech samples, ratings reflected the affective content of tone of voice without the influence of verbal affective content. The stimulus tape was played individually to the adult raters using an AIWA Model HS-PO2 cassette player. The affective content of the samples was rated using a 5-point Likert scale. The points on the scale were labeled "really happy," "sort of happy," "just okay," "sort of mad," and "really mad".

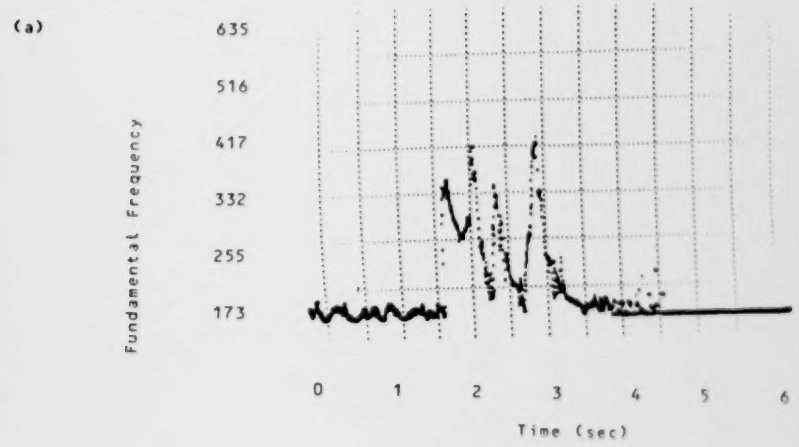
Child ratings. Of the 38 samples rated by the adults, 18 (9 happy and 9 angry) were recorded onto a separate cassette tape for presentation to the children. Adults had rated 16 of these samples at criterion agreement (.80). Two additional samples were included for which the criterion was approached but not reached. The order of the samples was randomized with the restriction that there were no more than

three samples of the same affect in consecutive order. The children rated the reiterant speech samples using a 5-point Likert scale which had faces drawn above each point labeled "really happy," "sort of happy," "just okay," "sort of mad," or "really mad" (see Appendix E). The rating task was completed by each child individually in a room at the child's school. Following completion of the rating task, a short form WISC-R (vocabulary and block design) was administered to each child. The WISC-R assessment was presented as part of the experimental procedure and was not discussed as a separate measure.

Results and Discussion

Acoustical measures. Graphs of the pitch lines were obtained for both members of each pair of stimuli (nonreiterant and reiterant speech samples) using the Visi-Pitch pitch extracting device (see Figures 1 and 2). As can be seen from these figures, the overall contour of each repetition of the sentence is similar, although there are substantial differences in pitch range between those speech samples which are intended to represent happiness and those intended to represent anger.

Figure 1. Experiment 2. Fundamental frequency contours for the sentence, "You're doing a great job." (a) Sentence read in a happy tone of voice. (b) Sentence read in a happy tone of voice using reiterant technique.



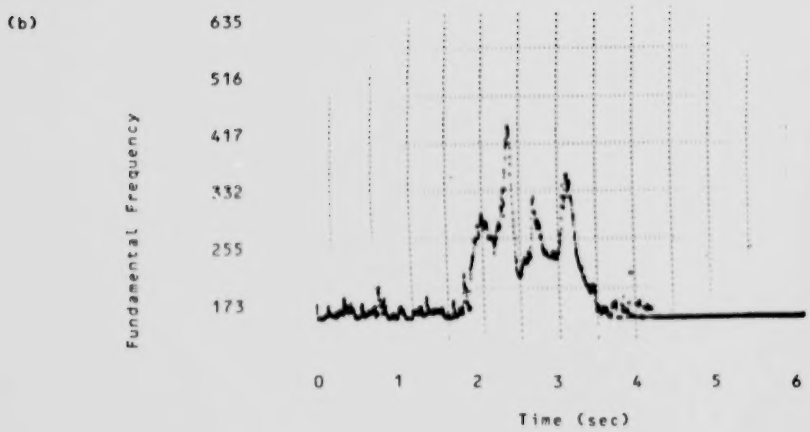
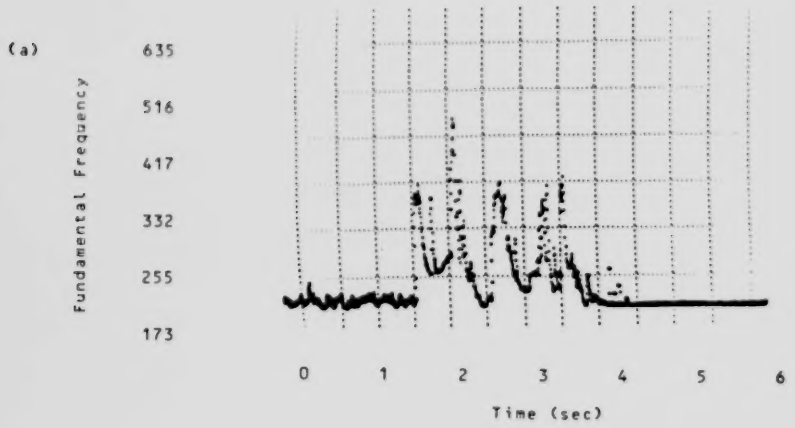
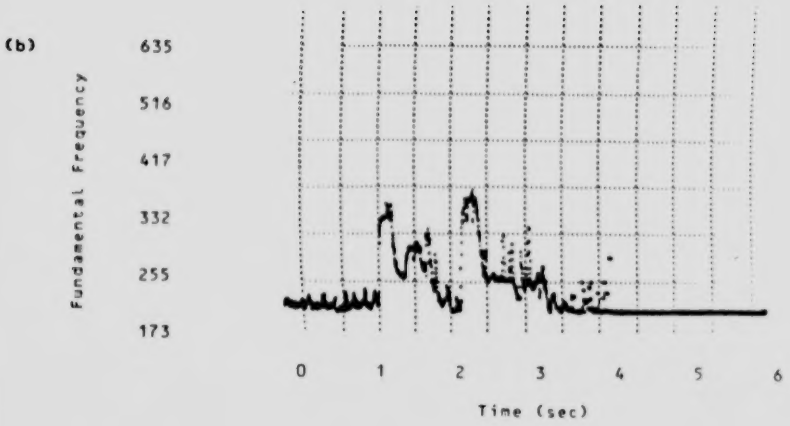


Figure 2. Experiment 2. Fundamental frequency contours for the sentence, "You're doing a great job." (a) Sentence read in an angry tone of voice. (b) Sentence read in an angry tone of voice using reiterant technique.





Fundamental frequency (FO) range (highest FO minus lowest FO) was computed for both members of each pair of stimuli. A distribution of difference scores between the members of each pair of speech samples was generated during pilot testing and a criterion difference of less than or equal to one standard deviation (15 Hz) was established to determine whether the speech samples were sufficiently similar in fundamental frequency.

For those stimuli which became part of the study, the mean difference score between pairs of stimuli was 7.1 Hz with a standard deviation of 4 Hz. The substantial decrease in variance between the pilot and actual samples can be attributed to practice of the reiterant speech technique. It was observed that, during stimulus generation, simple repetition of a reiterant speech sample could result in a much closer approximation of the original speech stimulus.

When the speech samples were examined with respect to the affective states they represented (happy or angry), the mean difference scores between members of stimulus pairs were similar. For those stimulus pairs intended to represent a happy affective state, the mean difference score was 7.7 Hz with a standard deviation of 4 Hz. The mean difference score between members of pairs of stimuli intended to represent an angry affective state was 6.4 Hz with a standard deviation of 3.9 Hz. It was the speaker's subjective feeling that it was

much easier to produce similar pairs of angry stimuli than it was to produce similar pairs of happy stimuli. The difference in mean difference scores between groups, however slight, appears to bear this out.

The mean fundamental frequency range for all speech samples (reiterant and nonreiterant) was 191.34 Hz with a standard deviation of 86.54 Hz. There was a difference in FO ranges between happy and angry stimuli with happy stimuli (reiterant and nonreiterant) producing a mean range of 261.5 Hz (standard deviation equals 49.7 Hz). The mean range produced by the same verbal stimuli read in an angry tone of voice (reiterant and nonreiterant) was 133.3 Hz with a standard deviation of 44 Hz. Clearly, happy tones of voice produced wider fundamental frequency ranges than did angry tones of voice. This can be understood in terms of pitch, the perceptual component of fundamental frequency. A wide fundamental frequency range is perceived as variability in pitch. Conversely, a narrow range is perceived as more flat in pitch and less variable. It must be emphasized that pitch range reflects only the variability of pitch within a given utterance and not its absolute level.

Psychological measures. Inter-rater agreement was computed for each group of raters using the formula: agreement = # of agreements/# of agreements plus # of disagreements. The 5-point scale was collapsed as in Experiment 1; a rating of 1 or 2 was considered a happy rating, 3 was scored as neutral, and a rating of 4 or 5 was scored as an angry rating. Criterion agreement was set at. 80 in the direction of the intended affective state (happy or angry). In order for a sentence to be included in the study, both the happy and angry reiterant speech samples of that sentence had to be rated at criterion levels under both conditions and by both groups of raters.

Of the 38 reiterant speech samples rated by the adults, criterion agreement was met for 22 (13 happy and 9 angry). However, it was often the case that one reiterant speech sample (happy or angry) would be rated at criterion for a given sentence while a second reiterant sample would not. This precluded the inclusion of such sentences in the final stimulus set since it was important to control for verbal, as well as vocal, content. Both happy and angry reiterant

counterparts were rated at criterion agreement for seven sentences (4 happy and 3 angry) from the stimulus set. Two other sentences (1 happy and 1 angry) received ratings at criterion agreement for the happy reiterant speech samples but not for the angry samples. The level of agreement for the angry reiterant readings of these sentences was. 67 (4 out of 6 raters). Although criterion agreement was not reached for these samples, both the happy and angry reiterant samples were included in the stimulus set for the child raters. It was thought that the children might show greater agreement in their ratings of these stimuli than did the adults. The resulting stimulus set included nine sentences (5 happy verbal content and 4 angry verbal content) read in both happy and angry tones of voice.

The child raters were presented with a stimulus set of 18 reiterant speech samples (9 happy tone of voice and 9 angry tone of voice). Criterion agreement was met in only 4 cases (3 happy tone of voice and 1 angry tone of voice). The two samples which did not meet criterion agreement in the adult ratings but were included in the stimulus set for the child raters were not rated at criterion agreement by the children. Criterion agreement was not met for both reiterant speech samples from any one sentence. The mean level of agreement for all speech samples in the stimulus set was 61%.

In the current study, criterion agreement was met for only 22% of the stimuli presented. This led to concern over the psychological validity of these stimuli for children. Dimitrovsky (1964) reported that 9-year-olds in her study were able to correctly identify happiness in 63.2% of voice recordings intended to be happy and to correctly identify anger in 62.1% of voice recordings intended to be angry. Likewise, Matsumoto and Kishimoto (1983) found that nearly 80% of 9-year-olds tested correctly identified happiness in a voice recording rated as happy by adults and that 70% of the 9-year-olds tested correctly identified anger in a voice recording rated as angry by adults. Chi-square goodness of fit tests were conducted for each of the stimuli in order to reconcile these results with those of the earlier literature (see Table 1). For chi-square calculation, the five-point scale was collapsed into three conditions: happy, just okay (neutral), and angry. Children correctly identified 66.6% of the stimuli at a level exceeding chance X^2 (2, #N = 12), $p < .05$ (see Table 1 for all chi-square values). This figure

includes 77.7% of those reiterant speech samples previously rated as happy and 55.5% of those samples previously rated as angry.

Table 1

Chi-square Values for Children's Ratings of Reiterant Tone of Voice Stimuli in Experiment 2.

Stimulus	Tone of Voice	Chi-Square (2, N = 12)	Agreement %
1	angry	4.5	25
2	angry	.5	42
3	happy	14	83**
4	angry	18.5	92**
5	angry	1.5	17
6	happy	9.5	75**
7	happy	18.5	92**
8	angry	6	67**
9	angry	6.5	67**
10	happy	6	67**
11	happy	6.5	67**
12	angry	9.5	75**
13	happy	6.5	67**
14	happy	14	83**
15	angry	9.5	75**
16	angry	4.5	25
17	happy	3.25	33
18	happy	2	50

*$p < .05$
**$p < .01$

These figures are comparable to those in the literature and indicate

that the stimuli used in this study are sufficiently similar to those used in previous research in terms of relative rates of correct recognition. However, the lack of agreement among raters is cause for concern. This may indicate that above chance recognition is not a sufficient criterion for the selection of stimuli for research purposes.

Solomon and Ali (1972) found that, when presented with voice recordings in which the verbal content and tone of voice were discrepant, children rated the stimuli in accordance with the information provided by the verbal content channel. This effect peaked around 11 years of age. The levels of agreement among child raters in the present study lend further support to Solomon and Ali's findings. If children had expertise in decoding affect in tone of voice, it would be reasonable to expect that levels of agreement would be higher than those observed in this and other studies (Dimitrovsky, 1964; Matsumoto & Kishimoto, 1983). It is not clear what mechanism may account for this apparent lack of correspondence between children's affective interpretations of the stimuli and the intended affective content of the vocal channel. Although the Dimitrovsky (1964) and Matsumoto and Kishimoto (1983) studies report significant levels of recognition of vocal affective content by children, they do not address the issue of inter-rater agreement. Clearly, this is a methodological issue worthy of further research. The full sentence counterparts for all 18 of the stimuli presented to the child raters were selected as the stimulus set for the third experiment in this series.

Experiment 3

Method

In Experiment 3, the stimuli which were developed and validated in Experiments 1 and 2 were presented to normal and disturbed children. For each sentence, the children were asked to rate how they thought the speaker felt.

Subjects

Normal sample. Thirty-four children, ages 7 to 10 years, were selected from regular classrooms in the Hillsborough County School

System and constituted the normal sample. The children were screened for ethnicity, sex, SES, and hearing impairment (see page 25 for information on screening procedures). They were matched on ethnicity, sex, and SES with the child raters from Experiments 1 and 2. Children were screened for hearing impairment on the basis of information obtained from the school records. In addition, each child was administered a short form WISC-R as part of the experimental task to obtain estimated IQ scores which were used as covariates in the final data analyses.

The demographic characteristics of this sample were as follows: low SES black males = 21%, low SES black females = 3%, higher SES black females = 15%, low SES white males = 15%, low SES white females = 21%, higher SES white males = 9%, and higher SES white females = 18%. The mean estimated IQ for the normal sample was 93.5 with a SD of 13.5.

Disturbed sample. Thirty-four children, ages 7 to 10 years, were chosen from the country's Severely Emotionally Disturbed Program (SED) and constituted the disturbed sample. Disturbance was operationally defined according to the Education of the Handicapped Act, Part B as amended by Public Law 94.142 (1981) and Rule 6A-6.3016 of the Florida Administrative Code (1982) which are the criteria used for placing children in the SED program. This sample was also screened for ethnicity, sex, SES with the child raters from Experiment 1 and 2. Children were screened for hearing impairment on the basis of information obtained from the school records.

The demographic characteristics of the disturbed sample were as follows: low SES black males = 26%, low SES black females = 3%, higher SES black females = 9%, low SES white males = 18%, low SES white females = 24%, higher SES white males = 15%, and higher SES white females = 6%. The mean estimated IQ for the disturbed sample was 88.1 with a SD of 12.

Materials

The 18 stimulus sentence counterparts (tone of voice plus verbal content) of the reiterant speech samples which were rated in Experiment 2 were tape-recorded onto cassette tape in a random order with the restriction that no more than two sentences representing the same affect were recorded consecutively. A second tape was made of these stimuli in reverse order from the first. The resulting tapes included five happy content-happy tone of voice, five happy content-angry tone of voice, four angry content-angry tone of voice, and four angry content-angry tone of voice recordings. Thus, there were a total of 18 stimuli and representing four conditions in Experiment 3. The researcher was equipped with written instructions, a set of 5-point Likert scales for recording the children's responses, an 8½ x 11 inch sheet of paper on which five faces were drawn, and stimulus materials and recording sheets for the vocabulary and block design subscales of the WISC-R. Each face on the 8½ x 11 sheet represented a point on the Likert scales and was labeled "really happy", "sort of happy", "just okay", "sort of mad', or "really mad". The stimulus tapes were played to the children using an AIWA HS-PO2 cassette tape-player and headphones.

Procedure

A toy store scenario in which the toys and shelves block the child's view, but the child can overhear a "mom" talking was described to each child. The child was told that s/he was hearing a "mom" talking to her son/daughter but that the child could not see the mom. The child was instructed to attend to the stimuli and told that s/he would be answering a question about what s/he heard. This procedure was implemented by two experimenters who each tested an equal proportion of disturbed and normal subjects. The experimenter showed the child drawings of five faces similar to those placed on the rating scales in Experiments 1 and 2. The experimenter labeled each face verbally while pointing to it. The child was then asked to label each face. When the child could label each face correctly without the experimenter's assistance, the experiment proceeded. Each child heard all 18 stimuli (tone of voice plus verbal content) presented in a random order through a set of headphones. The order of the stimuli was counterbalanced for half of the subjects in each group. The

stimuli were presented to each subject individually in a room at the child's school. After each stimulus was played, the subject was asked, "How do you think this mom is feeling?" The child was instructed to respond by pointing to the face that looked the most like the way the child thought the speaker felt. Following completion of the rating task, a short form WISC-R (vocabulary and block design was administered to each child. The WISC-R assessment was presented as part of the experiment procedure and was not discussed as a separate measure.

Results and Discussion

Data in Experiment 3 were analyzed in two sets for each hypothesis tested. The first set consisted of the dependent measure (response scores on the five-point scale) taken across all 18 stimuli presented. The second data set consisted of the dependent measure taken across the 12 stimuli validated using the chi-square analysis in Experiment 2. These data were analyzed separately because it was expected that the reduced set of stimuli would be more reliable and would help to clarify results obtained using the full set of stimuli. Results from analysis of the full stimulus set are presented first for each hypothesis followed by results from the analysis of the reduced stimulus set. For descriptive information, see Table 2. All hypotheses were tested using mixed models ANCOVAs with estimated IQ as the covariate. Estimated IQ correlated at-. 005 with children's ratings on the experimental scale ($p < .05$). The appropriateness of ANCOVA for these data was tested using the criteria provided by Tabachnich and Fidell (1983).

Table 2

Observed and Adjusted Mean Ratings of Affect in Messages

	Condition			
	happy content happy tone	happy content angry tone	angry content happy tone	angry content angry tone
Group				
Normal				
Observed	1.74	2.49	3.64	4.27
Adjusted	1.75	2.50	3.65	4.29
Disturbed				
Observed	1.35	1.97	3.86	4.38
Adjusted	1.34	1.96	3.85	4.37

To test the hypothesis that children's ratings would be a function of the type of message and the disturbed status of the child, two 2X2 mixed models ANCOVAs were conducted with type of message (discrepant vs. nondiscrepant) as the within subjects factor and disturbance (disturbed vs. nondisturbed) as the between subjects factor. The first ANCOVA was conducted using the children's ratings of all stimuli presented as the dependent measure (see Table 3).

Table 3

Source Table of ANCOVA Effects for Type of Message and Disturbance with Covariate IQ Using Subjects' Ratings of the Full Stimulus Set (Experiment 3).

Source	S.S.	DF	MS	F
Within Cells	8.51704	65	.13101	
IQ	.31103	1	.31103	2.37368
Between Cells				
Disturb (D)	1.83818	1	1.83818	14.02855***
Within Cells	5.95225	66	.09010	
Type (T)	.20063	1	.20063	2.22348
D X T	.02623	1	.02623	.29090

***$p < .001$

A main effect of disturbance was found, $F(1,65) = 14.03$, $p < .001$, such that disturbed children rated both discrepant (**M** = 2.86) and nondiscrepant messages (**M** = 2.87) as being more happy than did normal children (**M** = 3.06 and 3.03, respectively).[1]

In the second analysis, only the ratings of those stimuli whose vocal affective content was correctly identified at a level exceeding chance using the chi-square analysis in Experiment 2 were included as the dependent measure (see Table 4). This was done in order to assess differences in effects that might result from using a reduced, though more valid, set of stimuli.

Table 4

Source Table of ANCOVA Effects for Type of Message and Disturbance with Covariate IQ Using Subjects' Ratings of the Reduced Set of Stimuli (Experiment 3).

Source	SS	DF	MS	F
Within Cells	13.45336	65	.20697	
IQ	.38186	1	.38186	1.84496
Between Cells				
Disturb (D)	.97403	1	.97403	4.70604*
Within Cells	10.61842	66	.16089	
Type (T)	7.21018	1	7.21018	44.81573***
D X T	.15753	1	.15753	.97913

**$p < .05$
***$p < .001$

The stimuli validated using the chi-square analysis were distributed across conditions as follows: four happy content-happy tone of voice, two happy content-angry tone of voice, three angry content-happy tone of voice, and three angry content-angry tone of voice. Again, a main effect of disturbance was found, $F(1,65) = 4.7$, $p < .05$. Disturbed children appeared to have rated both discrepant (**M** = 3.16) and nondiscrepant messages (**M** = 2.63) as more happy than did the normal sample (**M** = 3.24 and 2.85, respectively). In this second analysis, a main effect of type of message was also found, $F(1,66) = 44.8$, $p < .001$. Discrepant messages (**M** = 3.2 were rated as more angry than nondiscrepant messages (**M** = 2.74) by both groups of children.[2] These findings support the hypothesis that children's ratings would be a function of the type of message and the disturbed status of the child.

The hypothesis that normal children's ratings would most accurately reflect the affective loading of the verbal content channel was tested

using two 2X2X2 mixed models ANCOVAs. Content (happy vs. angry) and tone (happy vs. angry) were the within subjects factors and disturbance (disturbed vs. nondisturbed) was the between subjects factor with estimated IQ as the covariate. In the first ANCOVA, children's ratings of all stimuli presented in Experiment 3 were used as the dependent measure (see Table 5).

Table 5

Source Table of ANCOVA Effects for Content, Tone, and Disturbance with Covariate IQ Using Subjects' Ratings of the Full Stimulus Set (Experiment 3).

Source	SS	DF	MS	F
Within Cells	17.59850	65	.27075	
IQ	.48395	1	.48395	1.78745
Between Cells				
Disturb (D)	2.60174	1	2.60174	9.60950
Within Cells	32.72344	66	.49595	
Content (C)	313.14871	1	313.14871	631.41686***
D X C	6.87707	1	6.87707	13.86656***
Within Cells	19.76450	66	.29946	
Tone (T)	24.09155	1	24.09155	80.44940***
D X T	.31457	1	.31457	1.05044
Within Cells	10.98509	66	.16644	
C X T	.00773	1	.00773	.04644
D X C X T	.02780	1	.02780	.16705

**$p < .01$
***$p < .001$

A content by disturbance interaction was found, $F(1,66) = 13.87$, $p < .001$, though not in the predicted direction (see Figure 3). Disturbed children, as compared with the normal sample, appeared to have rated messages more in the direction of the affective loading of the verbal content channel.[3]

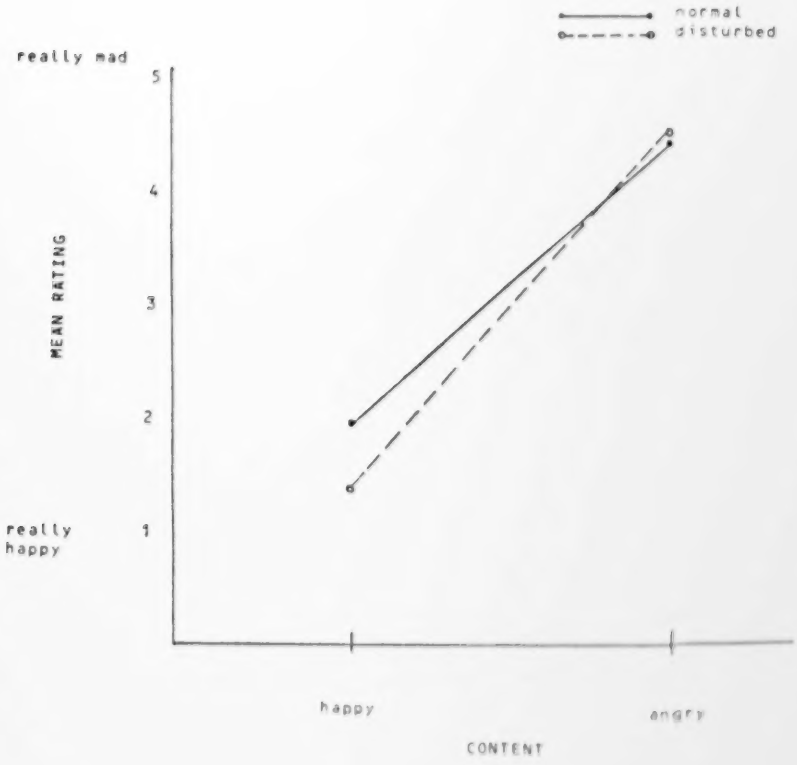


Figure 3. Mean ratings of messages by normal and disturbed children across levels of verbal content in Experiment 3.

A content by disturbance interaction, $F(1,66) = 8.04$, $p < .01$, was also found in the second content by tone by disturbance ANCOVA in which only the ratings of those stimuli which had been validated using the chi-square analysis in Experiment 2 were used as the dependent measure (see Table 6). Because it is reasonable to think that the stimuli validated by the child raters in Experiment 2 would be the most meaningful for children in Experiment 3, planned comparisons were conducted using only these stimuli.

Table 6

Source Table of ANCOVA Effects for Content, Tone, and Disturbance with Covariate IQ Using Subjects' Ratings of the Reduced Set of Stimuli (Experiment 3).

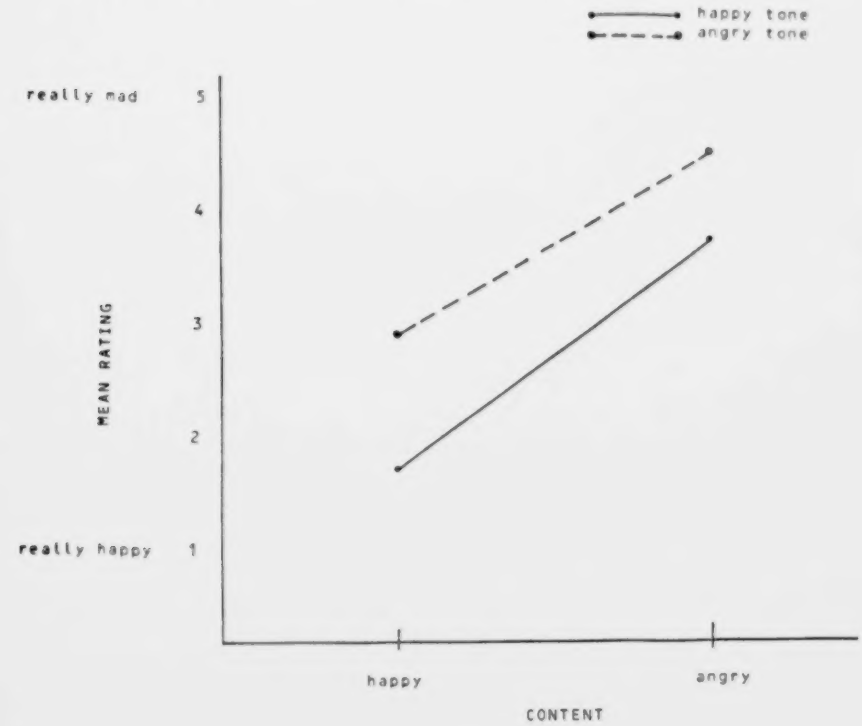
Source	SS	DF	MS	F
Within Cells	30.09187	65	.46295	
IQ	1.63632	1	1.63632	3.53454
Between Cells				
Disturb (D)	2.51790	1	2.51790	5.43880*
Within Cells	53.87525	66	.81629	
Content (C)	219.33103	1	219.33103	268.69198***
D X C	6.56273	1	6.56273	8.03969**
Within Cells	39.75189	66	.60230	
Tone (T)	65.93262	1	65.93262	109.46703***
D X T	.04292	1	.04292	.07126
Within Cells	23.99209	66	.36252	
C X T	2.22184	1	2.22184	6.11208*
D X C X T	.01351	1	.01351	.03715

*$p < .05$
**$p < .01$
***$p < .001$

The content by disturbance interaction appears to be due to a significant difference between groups, $t(66) = 3.95$, $p < .001$, for ratings of messages with happy verbal content. Disturbed children rated these messages as significantly more happy ($M = 1.70$) than did normal children ($M = 2.17$). The disturbed children's ratings reflected the affective loading of the verbal content channel for happy verbal content messages more than the normal children's ratings.

The ANCOVA conducted with only ratings of the stimuli validated in Experiment 2 as the dependent measure also yielded a significant content by tone interaction, $F(1,66) = 6.11$, $p < .05$, (see Figure 4) while the ANCOVA conducted using ratings from all stimuli presented in Experiment 3 did not.[4]

Figure 4. Mean ratings of happy and angry tone of voice messages across levels of verbal content in Experiment 3.



In order to describe this interaction, difference scores were calculated between the mean ratings for angry content-angry tone of voice and happy content-angry tone of voice messages (difference = 1.62) and between angry content-happy tone of voice and happy content-happy tone of voice messages (difference = 1.98). These scores represented the difference in ratings due to content while controlling for tone of voice. A post hoc comparison of these difference scores revealed that the difference in ratings between happy and angry verbal content messages was significantly greater, $t(67) = 2.49$, $p < .05$, when the messages were paired with a happy tone of voice (**M** difference = 1.98) than when the messages were paired with an angry tone of voice **M** difference = 1.62).

In both content by tone by disturbance ANCOVA's conducted, main effects were found for disturbance, $F(1,65) = 9.6$, $p < .01$, content, $F(1,66) = 631.4$, $p < .001$ and tone, $F(1,66)$ 80.4, $p < .001$, but there were no other statistically significant interactions. As in the type of message by disturbance analyses, disturbed children were found to rate messages as being more happy overall than did normal children. The main effects of content and tone reflected a tendency for children to rate angry affective loading in either channel as more angry than happy affective loading. That is, messages were interpreted as more angry when the affective loading of either channel changed from happy to angry. These findings do not support the hypothesis that normal children's ratings would most accurately reflect the affective loading of the verbal content channel.

Finally, the hypothesis that disturbed children would rate messages as more angry overall than normal children was not supported. This was suggested by the main effects of disturbance found in previous analyses. The hypothesis was also tested using two 2X2 mixed models ANCOVAs with consistent message (happy vs. angry) as the within subjects factor and disturbance as the between subjects factor. Estimated IQ was used as the covariate. It was thought that if a response bias toward happiness or anger was present in either group, it would be evidenced in differences between ratings on consistent happy and consistent angry messages.

One consistent message by disturbance analysis was conducted using children's ratings of all 18 stimuli presented as the dependent measure, while in the second only ratings of those 12 stimuli validated using the chi-square analysis in Experiment 2 were employed. Both analyses yielded similar results (see Tables 7 and 8).[5]

Table 7

Source Table of ANCOVA Effects for Consistent Message and Disturbance with Covariate IQ Using Subjects' Ratings of the Full Stimulus Set (Experiment 3.)

Source	SS	DF	MS	F
Within Cells	7.33148	65	.11279	
IQ	.43264	1	.43264	3.83574
Between Cells				
Disturb (D)	1.12348	1	1.12348	9.96060**
Within Cells	15.55235	66	.23564	
Consistent (C)	255.47771	1	255.47771	1084.17894***
D X C	2.12500	1	2.12500	9.01793**

**p < .01
***p < .001

Table 8

Source Table of ANCOVA Effects for Consistent Message and Disturbance with Covariate IQ Using Subjects' Ratings of the Reduced Stimulus Set (Experiment 3).

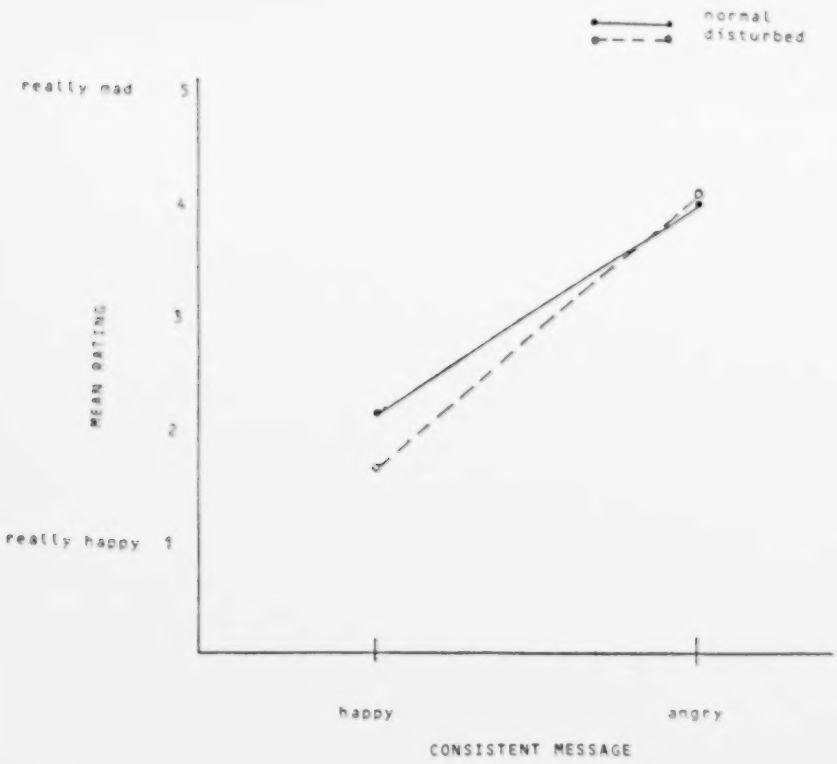
Source	SS	DF	MS	F
Within Cells	8.23204	65	.12665	
IQ	.32280	1	.32280	2.54880
Between Cells				
Disturb (D)	1.28152	1	1.28152	10.11888**
Within Cells	13.99112	66	.21199	
Consistent (C)	262.88601	1	262.88601	1240.19677***
D X C	2.77211	1	2.77211	13.07681**

**$p < .01$
***$p < .001$

A consistent message by disturbance interaction was observed, $F(1,66) = 13.08$, $p < .01$ (see Figure 5) with main effects of consistent message, $F(1,66) = 1240.1$, $p < .001$, and disturbance, $F(1,66) = 10.12$ $p < .01$ (based on analysis of the reduced set of stimuli).

As before, the main effect of disturbance is due to the tendency of the disturbed sample, in comparison to the normal sample, to rate messages as being more happy. The interaction effect appears to be due to a significant difference between the groups on mean ratings of happy content-happy tone of voice messages, $t(66) = 4.76$, $p < .001$, such that messages in this condition were rated more positively by disturbed ($M = 1.32$) than by normal children ($M = 1.78$). This seems to indicate that there is less difference in the interpretation of messages between normal and disturbed children as the affective loading shifts from happy to angry. Due to the fact that more stimuli were present in the consistent happy condition than in the consistent angry condition (4 stimuli as opposed to 3) and to a possible ceiling effect of angry ratings, this finding is difficult to interpret.

Figure 5. Mean ratings of consistent messages by normal and disturbed children across levels of consistent in Experiment 3.



The main effect of consistent message is due to both disturbed and normal samples rating consistent angry messages (**M** = 4.33) as more angry than consistent happy messages (**M** = 1.55). This finding is important in the sense that it provides a manipulation check and verifies the validity of the stimuli. The results of this analysis suggest that, contradictory to predictions, disturbed children interpret consistent happy messages as conveying more happiness when their ratings are compared with those of normal children.

The findings support the hypothesis that children's ratings would be a

function of both the type of message and the disturbed status of the child. The hypotheses that normal children's ratings would most accurately reflect the affective loading of the verbal content channel and that disturbed children would rate messages as more angry overall were not supported. In general, discrepant messages were rated as more angry than nondiscrepant messages and disturbed children's interpretations were happier than those of normal children.

General Discussion

This study was conducted to assess the differences between normal and disturbed children in the interpretation of the affective content of messages. To do this, the affective content of the stimuli had to be validated for each of the communicative channels (verbal content and tone of voice) independently. Experiment 1 was designed for the purpose of validating the verbal affective content of the stimuli. The approach was straightforward and resulted in a reduction of stimuli from the original 54 sentences to 29 after ratings were completed by both the adult and child groups. The use of child raters was an important consideration in rendering meaningful stimuli for presentation to the children in Experiment 3. Children may interpret affective content differently than adults than it should not be taken for granted that a valid stimulus for an adult is also valid for a child. This is evidenced by the fact that child raters reached criterion agreement on only half of the stimuli upon which adults reached criterion agreement.

Experiment 2 was designed to validate the affective content of tone of voice. This was considerably more difficult than the validation of verbal content in Experiment 1. Many methods, such as electronic filtering and random splicing, have been devised for removing verbal content from tone of voice. It seems, however, that there are inherent problems in each of these. Reiterant speech was thought to be a reasonable solution to this problem because it completely eliminated any meaningful verbal content without sacrificing the subtle nuances of tone of voice. Success with the reiterant technique requires a great deal of practice and cannot be accomplished within a few hours' time. While reiterant speech may replace other methods of separating content from tone of voice as state of the art, it must be noted that the development of valid stimuli with a phenomenon as subtle and difficult to measure as tone of voice is not easily achieved.

Another issue in tone of voice validation is the method of measuring the extent of correct identification of intended affective content. It was originally proposed that an agreement level of 80% would have to be reached among each group of raters in order for a stimulus to be considered valid. This was especially difficult to achieve with the child raters who, as we know from the literature (Solomon & Ali, 1972), interpret messages primarily on the basis of verbal content when compared with adults. Chi-square tests provide a more lenient measure of correct identification of the stimuli in which an agreement level of. 67 is required to reach a significance level of. 05 with an N of 12 and two degrees of freedom. Further research is required in this area to determine which measure will provide the more acceptable information about the way in which tone of voice is interpreted.

Finally, in Experiment 3, children's interpretations of messages across verbal content and tone of voice channels are examined. As expected, children's interpretations were a function of the type of message and the disturbed status of the child. Discrepant messages were rated by both groups of children as more angry than nondiscrepant messages. This finding further corroborates the work of McCluskey and Albas (1981) who reported that children felt more negatively when presented with discrepant as opposed to nondiscrepant messages. From the findings of the present study, it appears that children not only feel more negatively when presented with a discrepant message, but also interpret the speaker's intent more negatively.

In the literature, children have been compared with adults in their interpretations of messages (Bugental et al., 1970; Solomon & Ali, 1972) and it has been found that children interpret messages primarily on the basis of verbal content. When normal children were compared with disturbed children in this study, the effect of verbal content was most pronounced for the disturbed group. It is interesting to note that this effect is significant only for happy verbal content - happy tone of voice messages although the trend is stable across all conditions. This effect may be due to unequal numbers of stimuli across conditions or possibly to a ceiling effect for angry ratings. To capture real differences in ratings of stimuli which contain angry affective content in either or both channels, a new scale may have to be developed. The idea that disturbed children may interpret messages primarily on the basis of verbal content is an intriguing one given the literature which

suggests that disturbed children receive more discrepant messages than normal children (Blotcky et al., 1982; Bugental et al., 1971). It is also conceptually consistent with Bateson's theory (1956) that people who are exposed to discrepant or double-bind communication develop mechanisms of interpreting this communication on the basis of only one of the communicative channels. Further research is required to determine whether the effect of verbal content holds across conditions or is confined to a particular combination of affect in verbal content and tone of voice.

One of the most surprising findings of this study was that disturbed children interpreted messages as more happy than did normal children. This finding is in conflict with the results of McCluskey and Albas (1981) who found that disturbed children reported feeling more negatively overall in response to messages than did normal children. It seemed reasonable to expect that, if disturbed children felt more negatively overall, they would also interpret others as feeling more negatively. It was thought that the inclusion of IQ as a covariate might have accounted for the increased happy ratings of the disturbed group in the present study. Subsequent analyses conducted without a covariate do not bear this possibility out.

Another explanation for the difference between this study and that of McCluskey and Albas in the effect of disturbance is the difference in the populations investigated. In the McCluskey and Albas study, the children were from middle to upper middle-class homes. In the present study, children were mostly from lower SES households (60% for the normal group and 71% for the disturbed group). It is possible that children of lower SES backgrounds interpret happy content as more happy because they are simply less familiar with social situations in which happiness is a component.

There are many areas of child language and communication which require further investigation. This study has illustrated only a few of these, namely, appropriate strategies for measuring above chance recognition of vocal affective content, assessment of the effect of verbal content on disturbed children's interpretations, and the effect of socioeconomic status and sex on children's perceptions of happiness in speech. Specific approaches to these problems

include: methodological studies to investigate the use of multiple-criterion measures of children's interpretations of tone of voice, the development of separate scales to measure relative attributions of happiness and anger within a single message, and a comparison of children's interpretations of messages across socioeconomic statuses. Other areas that can be explored from this paradigm are hemospheric lateralization for emotion between normal and disturbed groups and cross-sectional research on the development of nonverbal sensitivity within disturbed populations.

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FOOTNOTES

[1]An ANOVA conducted on these data yielded an effect of type of message ($p < .05$) such that discrepant messages were rated as more angry than nondiscrepant messages by both groups of children.

[2]An ANOVA conducted on these data yielded similar results with the exception that the probability level for the effect of disturbance increased from .03 to .06

[3]An ANOVA conducted on these data yielded the same interaction and main effects.

[4]An ANOVA conducted on these data yielded similar results with the exception that an interaction of tone and content was not found.

[5]An ANOVA conducted on these data yielded identical results for both full and reduced sets of stimuli.